This dissertation looks at the role of the prosodic hierarchy in four phonological processes in the Vimeu dialect of Picard, a Gallo-Romance language: word-initial vowel epenthesis, word-final vowel epenthesis, word-final denasalization, and word-final floating consonant realization. A major goal of this study is to use phonetic correlates of phrasal boundaries, especially at the phonological phrase, intonational phrase, and utterance levels, as evidence for prosodic phrases. Approximately eight hours of spontaneous speech from five different speakers of Picard were examined, and over 10000 vowel durations and nearly 700 pause durations were analyzed. Mean vowel ratios were determined for each prosodic level, as well as mean pause durations for the intonational phrase and the utterance. Vowel ratios differed significantly between the utterance and the intonational phrase, between the intonational phrase and the phonological phrase, and between the phonological phrase and lower levels of prosody. Pause durations differed significantly between the intonational phrase and the utterance. These phonetic features were used along with other phonological and morpho-syntactic criteria to determine phrasal boundaries. Each of the four phonological phenomena is shown to be influenced by the presence of prosodic boundaries. Inside intonational phrases, word-initial vowel epenthesis occurs categorically in the C_CC environment and is nearly non-existent in the V_CC environment. At intonational phrase and utterance boundaries, the process occurs variably. Inside phonological phrases, word-final vowel epenthesis occurs categorically in the CC_C environment while the frequency of vowel insertion gradually decreases at the phonological boundary and higher. Word-final denasalization for point, one of two lexical items studied, is also found categorically phonological phrase-internally but gradually less frequently at higher levels. Word-final consonant realization was found to be triggered by both segmental and prosodic environments. An Optimality Theory analysis relying on crucially unranked constraints is proposed for each phenomenon.